

**Notice of Allowability**

Application No.

10/694,830

Examiner

Matt P Hodges

Applicant(s)

KANA O ET AL

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to \_\_\_\_.
2. ☒ The allowed claim(s) is/are 1-6.
3. ☒ The drawings filed on 29 October 2003 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- \* Certified copies not received: \_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date 10/29/2003
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_.

## DETAILED ACTION

### *Allowable Subject Matter*

Claims 1-6 are allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claim 1, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 1, and specifically comprising the limitation of a spark plug including: a center electrode; an insulator holding said the electrode; a housing holding and fixing the insulator, and a ground electrode having one end portion connected to the housing and the other end portion opposed to the center electrode via a discharge gap intervening there between, where an Ir alloy firing tip made of a rod-like Ir alloy is connected to a portion of at least one of the center electrode and the ground electrode facing to said discharge gap, a cross-sectional area of the Ir alloy firing tip taken along a plane perpendicular to an axis of the Ir alloy firing tip has an out-of-round configuration, in the cross-sectional area of the Ir alloy firing tip, when it is assumed that a circumscribed circle has a largest diameter A among virtual circles each contacting at least three portions of a visible outline of the cross-sectional area and an inscribed circle has a largest diameter B among inscribed circles each being coaxial with the circumscribed circle, a ratio of the diameter B to said diameter A (i.e.,  $B/A$ ) is equal to or larger than 0.8 and is less than 1.0, the visible outline of the cross-sectional area is constituted by a serial joint of at least seven straight or curved line elements, and an angle between each line element and an adjacent line element is not less than  $125^\circ$  and is not larger than  $235^\circ$ . The closest prior art of reference is Osamura et al. (US 5,977,695) which discloses the use of an emitter tip of various forms including a hexagon. However Osamura does not provide any

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motivation as to why additional sides would be advantageous to the emitter tip and the claim is not met by a hexagon structure. The hexagon structure does not have enough line elements and has too shallow of an angle. Chiu et al. (US 5,856,724) does teach the advantageous use of increasing the number of sides over the prior art however Chiu does not anticipated a 7 or more sided figure, further Chiu preferable teaches structures that include acute angles. The inclusion of acute angles as demonstrated by Chiu either lead to a structure that does fit the ratio required or has angles less than  $125^\circ$ .

Regarding claims 2-5, claims 2-5 are allowable for the reasons given in claim 1 because of their dependency status from claim 1.

Regarding claim 6, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 6, and specifically comprising the limitation of the manufacture of a spark plug including: a center electrode; an insulator holding said the electrode; a housing holding and fixing the insulator, and a ground electrode having one end portion connected to the housing and the other end portion opposed to the center electrode via a discharge gap intervening there between, where an Ir alloy firing tip made of a rod-like Ir alloy is connected to a portion of at least one of the center electrode and the ground electrode facing to said discharge gap, a cross-sectional area of the Ir alloy firing tip taken along a plane perpendicular to an axis of the Ir alloy firing tip has an out-of-round configuration, in the cross-sectional area of the Ir alloy firing tip, when it is assumed that a circumscribed circle has a largest diameter A among virtual circles each contacting at least three portions of a visible outline of the cross-sectional area and an inscribed circle has a largest diameter B among inscribed circles each being coaxial with the circumscribed circle, a ratio of the diameter B to

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said diameter A (i.e.,  $B/A$ ) is equal to or larger than 0.8 and is less than 1.0, the visible outline of the cross-sectional area is constituted by a serial joint of at least seven straight or curved line elements, and an angle between each line element and an adjacent line element is not less than  $125^\circ$  and is not larger than  $235^\circ$ . Where the entire circumferential surface of the Ir alloy firing tip is welded by Laser welding to at least one of the center electrode and the ground electrode. For the same reasons as listed in claim 1 above, the prior art of record does not appear to anticipate the claimed manufacturing method.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### *Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Chiu et al. (US 5,856,724) discloses the use of changing the tip emitter structure for a spark plug.

Kato et al. (US 5,877,584) discloses the use of altering the emitter structure diameter and shape to improve efficiency.


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*Contact Information*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matt P Hodges whose telephone number is (571) 272-2454. The examiner can normally be reached on 7:30 AM to 4:00 PM M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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